# NON-LOCAL QUASIPARTICLE EXCITATIONS

J. Chang[1,2], M. Maansson[4], S. Pailhes[2], T. Claesson[4], O. J. Lipscombe[3], S. M. Hayden[3]
L. Patthey[2], J. Mesot[1,2] and O. Tjernberg[4]

[1]ICMP @ EPFL & [2]SLS @ PSI, Switzerland
[3]University of Bristol, UK
[4] KTH, Sweden

## LANDAU FERMI LIQUID THEORY:

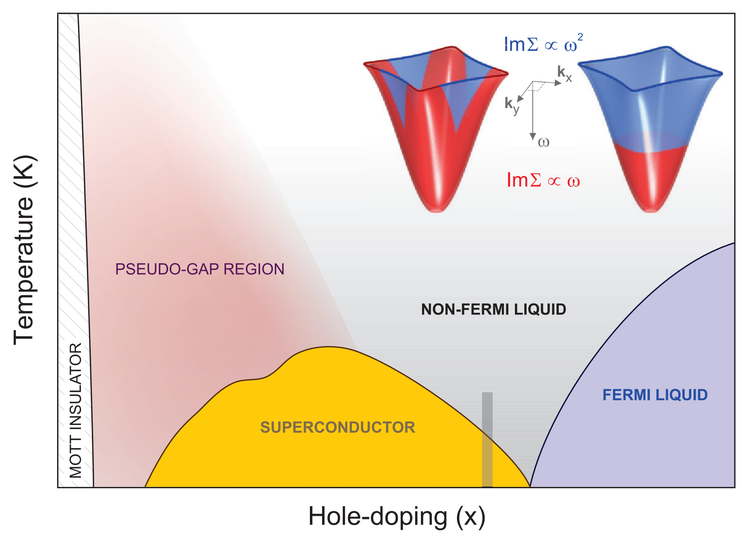
$$A(\mathbf{k},\omega) = \frac{1}{\pi}\frac{-\,\mathrm{Im}\,\Sigma(\mathbf{k},\omega)}{[\omega - \mathrm{Re}\,\Sigma(\mathbf{k},\omega) - \varepsilon_{\mathbf{k}}]^2 + [\mathrm{Im}\,\Sigma(\mathbf{k},\omega)]^2}$$

$$\mathrm{Im}\Sigma(\omega) = -\lambda \begin{cases} (\omega/\omega_c)^2, & \omega < \omega_c, \\ F\,(\omega/\omega_c)\,, & \omega > \omega_c, \end{cases} \qquad \mathrm{Re}\Sigma = \mathcal{P}\int_{-\omega_c}^{\omega_c} \frac{\mathrm{Im}\Sigma(\omega')}{\omega' - \omega} d\omega'$$

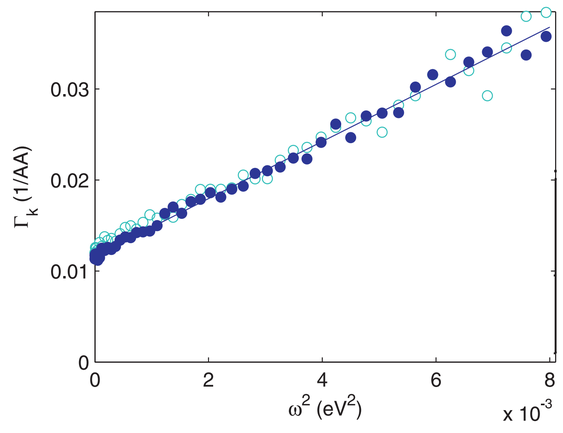
A(k,ω) Spectral function
Σ(k,ω) Self-energy
$\varepsilon_k$ Bare band
λ Coupling constant
$\omega_c$ Fermi liquid cut-off

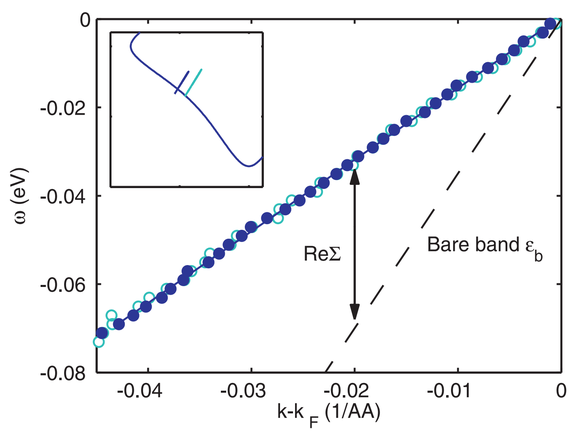
**EXPERIMENT**: Angle resolved photoemission spectrocopy on **$La_{2-x}Sr_xCuO_4$ (x = 0.23)**

## SCHEMATIC PHASE DIAGRAM




## KRAMERS-KONIG SELF-CONSISTENCY

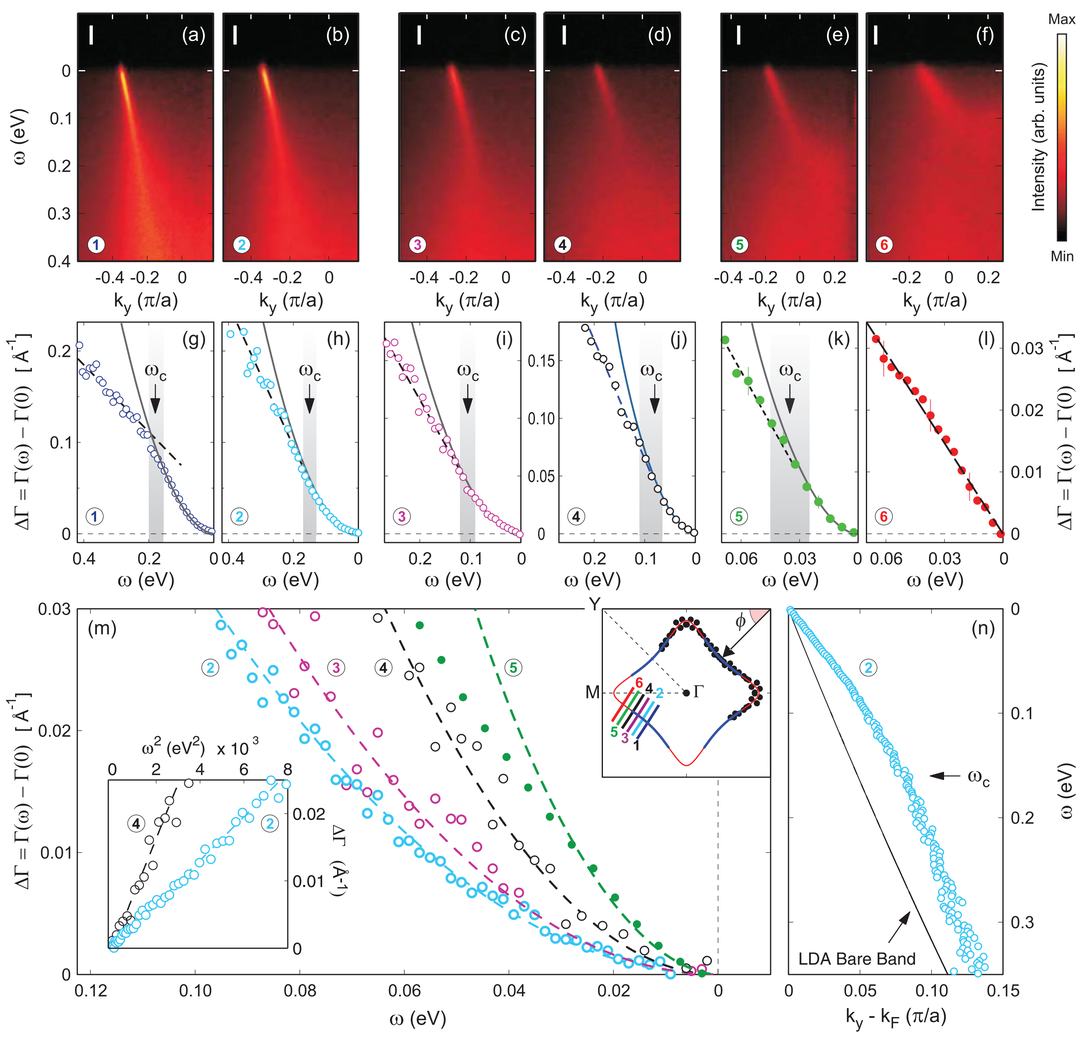



$$\mathrm{Im}\Sigma = v_k \Gamma_k$$

$v_k$ = 3.5 eVA

## ARPES SPECTRA & LINE WIDTH ANALYSIS




## FERMI-LIQUID PARAMETERS